

## Newsletter

*Pathways to strengthened agri-food research and innovation systems in Asia and the Pacific*



1<sup>st</sup> APAARI Executive Committee  
Meeting 2019, Bangkok - [page 2](#)



Modern farm of IHEC, Iran - [page 11](#)



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## EDITORIAL TEAM

- Ms. Martina Spisiakova
- Ms. Mellissa Wood
- Ms. Celilu Bitong
- Dr. Ravi Khetarpal

## Editorial

### Tracking the progress towards the SDGs

Four years after the adoption of the 2030 Agenda for Sustainable Development with its 17 **Sustainable Development Goals (SDGs)** at its heart, APAARI has undergone a major transformation to better strengthen agricultural innovation systems (AIS) and enhance its contribution to the SDGs.

In 2016, following a review and consultations with its members and partners, APAARI published its Vision 2030 that defines its main thematic thrusts and core functional areas aligned with the SDGs. The Vision provided a basic framework for developing APAARI's Strategic Plan 2017-2022 – a roadmap through which the APAARI Community collectively contributes to the realization of the Vision and the SDGs.

Out of the 17 SDGs, the one towards which APAARI has been contributing most is SDG2 to "End hunger, achieve food security and improved nutrition, and promote sustainable agriculture". All detailed targets of this SDG are in the centre of APAARI's renewed focus to help its members and partners adapt to the dynamic and rapidly changing context of agri-food systems through improved technologies and processes for agricultural innovation.

An example is APAARI's recent engagement as a regional leader of the **Smart Food Initiative** (an ICRISAT led Afro-Asian Consortium) in Asia Pacific. Through promotion of dryland cereals and grain legumes, such as millet and sorghum, that are nutrient dense, able to tolerate high temperatures and drought, require less water, and are important crops for small farmers in the poorest parts of Asia and the Pacific, APAARI directly contributes to fighting hunger and undernutrition in the region.

APAARI has recently established its first ever **Center of Excellence in Agricultural Value Chain** at the National Chung Hsing University, Taichung,

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Taiwan, which will be a platform for capacity building in various components of value chain for the less privileged countries of Asia-Pacific.

To address the crucial issue of declining public investments in agricultural research and innovation to improve food security in the region, APAARI has been promoting improved investments in agri-food research and technologies through the **Agricultural Science and Technology Indicators (ASTI)** project. As such, it works with national partners to collect, compile and disseminate information on financial, human and institutional resources to key stakeholders to influence future investments and policies.

Strengthening the **technical and functional capacities** (soft skills) of APAARI's members and partners in key areas of food and agriculture, as well as effective knowledge management, are critical to develop technologies that are suitable for small farmers to improve their livelihoods, resilience and adaptive capacity to the ever-changing agri-food system.

Some recent capacity development activities targeting APAARI members and partners addressed thematic areas such as, **biotechnology, bioresources, biodiversity, agricultural trade and markets, food value chains, residue mitigation, food safety, animal science, and agricultural education** that are becoming increasingly important to improve food security and nutrition, and ensure sustainability of the agri-food sector and rural areas. Besides, new partnerships developed with the EU, USDA, CIRAD, WTO, UNESCO, UNESCAP, ISAAA and ICGEB will further strengthen the technical base and outreach of APAARI activities along with initiating new areas of work in the agri-food research and innovation system.

In addition to the re-oriented operations in the context of the new SDGs and APAARI Strategic Plan 2017-2022 to support members and partners in the region, APAARI has made an enormous progress in its governance and management. It has gone for a major revision in the APAARI Constitution, which will pave the way to work more effectively. Since 2017, it has significantly increased its budget through rising membership, increasing projects and collaboration with current and new partners. It has made large projections for new activities, developing policies and management standards that provide clarity of management reforms.

APAARI Secretariat is now actively addressing the most important challenge, which is to obtain its **legal status** as an independent international organization in Thailand – a task, which has been long pending. This will provide APAARI a new horizon for growth and strengthen its strategic partnerships with relevant organizations in the region. The transformation of APAARI thus will be critical to meet its mission on strengthening agri-food research and innovation systems for sustainable development in the region. The

transition is a tedious task to which the APAARI Secretariat is fully committed.

These improvements are critical for the sustainability of the Association that as a regional bridging organization continues to add value particularly to national agricultural research systems, international agricultural research community, and higher education in terms of strengthened capacities and knowledge base to enable agricultural innovation. The recently developed Monitoring, Evaluation, Reporting and Learning (MERL) Framework has become an integral part of APAARI's operations for monitoring the performance of its projects and programmes, as well as progress towards the SDGs. We have a clear vision and commitment to achieve our targets in a mission mode, with active cooperation from our members and development partners. "With valuable guidance of APAARI's Executive Committee and their commitment to enhanced collective action, APAARI will continue striving towards excellence, adding value in the region."

**Dr Ravi Khetarpal**  
Executive Secretary - APAARI



## HIGHLIGHTS FROM THE APAARI SECRETARIAT

### The Executive Committee praises APAARI's progress

The first meeting of the APAARI Executive Committee (EC) for 2019 was held on 13 June 2019 in Bangkok, Thailand, under the Chairmanship of Ms. Melissa Wood, Chair, APAARI, and General Manager, Global Program, Australian Centre for International Research (ACIAR), Australia.



Participants of the first Executive Committee Meeting 2019

The Secretariat team presented the status of taken actions on the recommendations made by the previous EC meeting and General Assembly Meeting; the recently initiated Monitoring, Evaluation, Reporting and Learning (MERL) activities; and overall progress made by APAARI during the period December 2018 to April 2019 with respect to governance, partnerships as well, Asia-Pacific Consortium on Agrobiotechnology and Bioresources (APCoAB), Agricultural Science and Technology Indicators (ASTI) project, and Knowledge Management (KM). New project scoping and development, submitted and secured projects, as well as

membership drive, collaboration, participation in meetings organized by other organizations, new recruitments and country visits were presented too. The team further presented the APAARI Work Plan in relation to these key activities mentioned above.

The APAARI Constitution has been going through review and amendments to make the management and governance of APAARI more effective, specifically in addressing the changing context of agri-food systems in the Asia-Pacific Region. The final draft of the amended Constitution was presented and discussed. Furthermore, the newly drafted APAARI Membership Strategy, encompassing strategic considerations and basic guiding principles involved in the mobilization and management of the APAARI membership was presented for the first time to the EC members. The strategy will be integrated in the overall Resource Mobilization Strategy of the Association, which has now been completed. This is to ensure a systematic and coordinated approach to guide the Association in securing new and additional resources, as well as making better use of existing resources.

As integral efforts of enhancing APAARI management and governance through comprehensive review and amendments to APAARI Constitution, further measures in terms of various Management Standards (Membership Management Standard, Management Standard for the Executive Committee, Management Standard for the Executive Secretary) and Rules of Procedure – General Assembly, were proposed and endorsed by the EC. They will provide the necessary and basic framework in enhancing and improving APAARI's overall performance to bring positive impacts.

*"There is a big appreciation of FAO for being invited to the EC meeting, which shows the value of our partnership," Dr. Abdoulaye Saley Moussa, FAO*

Regarding the membership and fee payment status as of 30 April 2019, it was highlighted that APAARI had 80 members and a number of key issues to resolve. These include: inability to pay or continue as members, pending payments, and difficulty of some members to pay arrears. The summary Income and Expenditure Statements, Audit Report, an overview of status and position of financial resources of APAARI, as well as how these have been managed effectively were also presented. A shift to a new financial management system that is in line with international standards was stressed, as an important measure of APAARI to effectively manage and account for income and expenditures from 2018.

A key administrative issue that was explored was the process of obtaining the legal status for APAARI in Thailand, and related communication and relations with respective

government agencies in the country, as well as the Food and Agriculture Organization of the United Nations (FAO), Regional Office for Asia-Pacific (RAP). Presentations by the special invitees highlighting topics of collaboration and potential collaboration with APAARI included: scaling up R&D (Dr. Taek Ryoun Kwon, Republic of Korea); SMART Food Initiative (Ms. Joanna Kane-Potaka, International Crops Research Institute for Semi-Arid Tropics – ICRISAT); agri-biotechnology (Dr. Shivendra Bajaj, Federation of Seed Industry / Alliance for Agri Innovation – FSII-AAI of India); transformation of agricultural education (Dr. Kumar, Tamil Nadu Agricultural University – TNAU); ASTI programme (Dr. Gert-Jan Stads, International Food Policy Research Institute – IFPRI); agroecology (Dr. Philippe Girard, French Agricultural Research Centre for International Development – CIRAD); Mega Seed Park Initiative (Dr. Varaprasad, India); and capacity development assessment (Dr. Abdoulaye Saley Moussa, FAO).

Both Ms. Wood and Dr. Mohapatra, Vice Chair of the EC and Director General, Indian Council of Agricultural Research (ICAR), expressed their appreciation of the enormous progress done by APAARI. This includes a significant increase in budget between 2017-2019, large projections for new activities, management standards providing clarity of management reforms, and legal status that all will provide new dimensions to APAARI operations. They both agreed that APAARI has matured compared to 2016 with enormous changes taking place, including at the governance level. APAARI is playing an important role by bringing institutions together to discuss common issues, which is its added value.



## 20<sup>th</sup> Steering Committee Meeting of APCoAB discusses progress in agri-biotechnology and bioresources

The 20<sup>th</sup> Steering Committee (SC) Meeting of the Asia-Pacific Consortium on Agricultural Biotechnology and Bioresources (APCoAB) was held on 12 June 2019 in Bangkok, Thailand. Nineteen participants, comprising the Chairperson, Vice Chairperson, members of the SC, special invitees and observers, attended the workshop to discuss the Consortium's progress and work plan. Dr. Rishi Tyagi, Coordinator, APCoAB, presented the actions that have been taken based on the recommendations of the previous SC in 2018, APCoAB's progress covering 1 May 2018 – 31 May



20<sup>th</sup> APCoAB Steering Committee participants

2019, as well as its work plan for 2019. All of this has been endorsed and approved by the SC.



## Experts meet to discuss underutilized animal genetic resources and their amelioration

The Regional Workshop on Underutilized Animal Genetic Resources and their Amelioration was held on 4-6 March 2019 at the Malaysian Agricultural Research and Development Institute (MARDI) in Malaysia. APAARI, MARDI, APCoAB, Council of Agriculture (COA), Taiwan, and ACIAR jointly organized it, in collaboration with the Department of Veterinary Services (DVS) Malaysia, Department of Wildlife and National Parks (WILDLIFE) Malaysia, and Ministry of Agriculture and Agro-based Industry (MOA) Malaysia. A total of 63 participants from 14 countries in the Asia-Pacific region (Bangladesh, Bhutan, China, India, Iran, Kenya, Lao People's Democratic Republic, Malaysia, Nepal, Philippines, Pakistan, Sri Lanka, Taiwan and Thailand) attended the event. The participants were from a number of national organizations, such as research institutes, universities and research councils dealing with the management and conservation of underutilized animal genetic resources.



*Participants of the Regional Workshop*

The workshop assessed the current status of underutilized animal genetic resources at sub-regional level and R&D status of priority native breeds that are needed to promote the use of these resources in Asia-Pacific. It also identified the knowledge gaps and way forward in defining regional priorities concerning underutilized animal genetic resources, to create awareness on their role, value and potential for diversification of the food basket, and formulate strategies to strengthen the institutional, legal and policy framework for their sustainable utilization. The following are the key recommendations that emerged from the workshop:

1. Each Asia-Pacific country should have in place an enabling policy to protect, conserve, improve and use animal genetic resources, and conduct national assessments in this area.
2. The rights of smallholder farmers owning these resources need to be safeguarded through filing of their intellectual property rights (IPRs) and agreement on sharing of benefits.

3. The technology, facilities, training and education on value addition of indigenous animal genetic resources need to improve.
4. Farmers engaged in keeping underutilized species need enhanced skills and knowledge for development and commercialization of these value-added products.
5. Branding, marketing and national certification need to be developed and enhanced to promote products from indigenous species through awareness campaigns with the public.
6. Governments need to provide the legal provisions to protect the originality and exclusivity of indigenous animal products.
7. Production of products from indigenous animals needs to become more consistent and high quality managed through R&D and training.
8. To ensure sustainable partnership in the management of underutilized animal genetic resources, stakeholders need to be identified at national and regional levels and engaged.
9. Networking among interested actors need to be initiated to promote collaboration on key issues.
10. Knowledge management in specific areas of animal genetic resources needs to be strengthened, especially in relation to food security. For example, knowledge sharing can be enhanced through involvement of national stakeholders in capacity development programmes, development and accessibility of a centralized data bank/repository, newsletters, and awareness programmes to expose farmers to simple biotechnological methods in the identification and breeding of underutilized animal genetic resources.
11. A regional Asia-Pacific information system on animal genetic resources needs to be established to meet regional requirements while being tailored to meet each country's specific attributes. It needs to be linked to Domestic Animal Diversity Information Systems (DAD-IS) and Domestic Animal Genetic Resources Information Systems (DAGRIS).
12. Exchange of genetic materials of indigenous breeds is crucial and should be given priority. A regional genebank for gametes and embryos needs to be formed to facilitate regional sharing of genetic materials and enhance intra-regional exchange in animal genetic resources.
13. Capacity needs to be built through raising awareness on the importance of status, risk issues and conservation methods of animal genetic resources; seminars and workshops and hands-on training on modern biotechnologies; use of advanced technologies for the preservation of genetic materials and multiplication of breeding animals, including biotechnological methods in livestock production. Hands-on training is particularly needed by researchers, extensionists and farmers.
14. A consortium on underutilized animal genetic resources for Asia-Pacific should be established as a common platform for regional collaboration and

networking.

15. Collaborative projects among Asia-Pacific countries should be proposed on specific areas, such as breed characterization, genomic profiling, sexing and cryo-preservation of gametes and value addition.

The meeting emphasized that APAARI may facilitate the scoping for public and private partners and donors to mobilize financial support through regional proposals in the conservation and utilization of underutilized animal genetic resources.



### The 13<sup>th</sup> International Conference on Development of Drylands attracts high-level government representatives

ICAR-Central Arid Zone Research Institute, and Arid Zone Research Association of India, organized the 13<sup>th</sup> International Conference on Development of Drylands in Jodhpur, India, from 11-14 February 2019. APAARI and APCoAB were also the co-organizers. The Conference was inaugurated by Shri Gajendra Singh Shekhawat, Minister of State for Agriculture and Farmers Welfare, Government of India. About 379 participants, including researchers and policy makers, and 91 foreign delegates from 37 countries across five continents, attended the event.



Conference delegates

Five half-day satellite symposia (as concurrent sessions) were also organized on topics of contemporary importance in drylands.

Of the above, a satellite symposium on 'Dryland Agrobiodiversity for Adaptation to Climate Change', was co-hosted by the Indian Society of Plant Genetic Resources (ISPGR), Bioversity International (BI) and APAARI, with support from the United Nations Environment Programme (UNEP) and APCoAB. Dr Rishi Tyagi, APCoAB Coordinator, participated and co-chaired a technical session.

Based on the event's deliberations, the participants unanimously endorsed for following action points as a road map in the form of "Jodhpur Declaration" comprising of the following action points for urgent attention of all stakeholders, including policy makers, for implementation:

1. Development of appropriate adaptive and mitigation strategies for drylands needs a precise assessment of impact of climate change on local rather than global or regional scale, because of diversity in resources, farming systems and policies in different countries. To enable such assessments, international agreements, including Paris Agreement, Kyoto Protocol, the Sendai Framework for Disaster Risk Reduction, and Sustainable Development Goals (SDGs), need to be adhered to.
2. Appropriate irrigation practices need to be promoted, with greater focus on micro-irrigation, even in canal command areas, to enhance water productivity in the context of increasing water scarcity. Technologies for efficient use of brackish water need to be developed, including conjunctive use for irrigation, fishery, and other areas. On-farm water conservation must be encouraged through good watershed management practices involving local communities, forming water-users associations, and public awareness campaign.
3. Scientific land use planning, along with sustainable farming practices needs to be promoted to sustainably use, manage, conserve natural resources and made accessible to farmers. Efforts need to be made to scale out innovations that save soil, water, nutrients, biodiversity, energy and labour, e.g. the use of solar energy in farm operations. Conservation Agriculture based Sustainable Intensification (CASI) should be prioritized, while removing the technological, socio-economic and policy bottlenecks that hamper its wide-scale adoption. Learning from success stories needs to be promoted to speed up the adoption of new technologies to enhance sustainability of drylands.
4. Sustainable agricultural diversification through horticulture, agroforestry, silvi-pasture and aquaculture, need to be promoted through increased emphasis on R&D for crops suitable for mixed and intercropping systems. Appropriate techniques for value addition and reduction of post-harvest losses, as well as the use of protected agriculture for more efficient utilization of soil, water and nutrients, which prolongs the period for crop production and ensures high economic returns under harsh dry environments, should be promoted.
5. Exploiting the genetic biodiversity available in drylands for developing high-yielding and stress-resistant genotypes using conventional breeding techniques, as well as the state of the art molecular biology and biotechnological tools, need to be promoted.
6. Rather than input subsidies, policy support is needed to enhance investment and compensation to farmers for the much needed environmental services they provide. Further, availability of easy credit at low interest rates, crop and livestock insurance, and access to timely and accurate weather forecasts, successful farming practices, and inputs and markets, would enhance resilience of dryland farming communities to

- 7. weather aberrations and secure their livelihoods.
- 7. Formation of local organizations, such as Farmer Producer Organizations (FPOs), micro enterprises, agri-clinics and custom-hiring centers for farm machinery, with necessary legal and policy framework, need to be encouraged. Provision of 'Pledged Storage' or warehouse receipt system around agri-markets, and linking farmers with markets through farmers' cooperatives around activities related to post-harvest processing and value addition would avoid distress sale.
- 8. A self-employed cadre of 'Technology Agents' and the use of new information technology tools need to be promoted to accelerate technology dissemination and improve the quality of extension services. Thrust is needed on vocational training of rural youth and farm graduates, and linking their services to farmers on consultancy basis through bankable projects.
- 9. Developing countries need to at least double their investments in agricultural research and innovation for development to address future challenges and to ensure food, nutritional and environmental security of the dryland eco-systems. Public-private sector partnership synergies will have to be fully harnessed in this regard.

Finally, the participants agreed that agriculture in the dry regions must be liberated from the scourge of hunger, poverty and malnutrition. Accelerated science and innovation-led agricultural growth, therefore, must be inclusive and should address needs and aspirations of resource-poor smallholders including women farmers.

In the future, the gains in agricultural production would largely depend on a paradigm shift from the 'integrated germplasm improvement' to 'integrated natural resource management' with focus on location-specific and farm typology-specific portfolios of climate-smart agriculture practices, services, and enabling policies for converting dryland areas from grey into green.



### APAARI members and partners discuss strategies for improving agricultural innovation system (AIS)

On 14 June 2019, APAARI organized a one-day interactive workshop on 'Innovation Strategies for Sustainable Agricultural Development' in Bangkok, Thailand, back-to-back with the EC Meeting. It was organized in the context of the Tropical Agriculture Platform (TAP) in collaboration with FAO, and support of Agrinatura and the European Union (EU). It explored current innovative initiatives in food and agriculture, commonalities and differences in innovation strategies of participating institutions, identified priority areas for agricultural innovation to be integrated in the participating organizations' innovation strategies, and made recommendations for decision makers to be integrated in

policy and legal frameworks. Through the use of interactive knowledge-sharing techniques, the meeting also promoted cross-fertilization between the participants to enhance learning and collaboration across the Asia-Pacific region.

A total of 35 participants, including the heads of APAARI's member and partner organizations representing national agricultural research system (NARS) organizations and institutes, international agricultural research centres, higher education, regional fora, international development organizations, and the private sector, actively engaged in discussions and contributed to the workshop's outcomes. The workshop was framed around the Agricultural Innovation System (AIS) perspective and participants were encouraged to adopt this mind set throughout the event and beyond. This is because agri-food systems in Asia-Pacific are increasingly transformed by the dynamic interaction of socio-economic and environmental factors, which requires innovation in agricultural and rural development to be based on multi-stakeholder interaction that includes private sector, farmers, and civil society, and cross-sectoral linkages with other areas impacting food and agriculture, including health and commerce.

The Common Framework developed by TAP partners builds on the AIS perspective, which emphasizes that agricultural innovation, as opposed to linear technology transfer models, results from a complex, multi-stakeholder process of interaction. Conceptually, the AIS comprises of research and education, business and enterprise, bridging institutions, and the enabling environment. This framework was fully integrated in the workshop. The discussions took place with these actor groups in the centre, an emphasis on getting the right mix of actors, mechanisms, processes and policies in place, and most importantly the need to build functional capacities (soft skills) to generate and use knowledge, and develop new technologies and business processes. So far, the AIS approach has not been fully reflected in all national policies and capacity development efforts. Through the workshop, APAARI played an important role to initiate such learning and knowledge sharing towards the change in mind sets and behaviours that are shaping the region's agri-food systems.

The exchange of innovative practices was facilitated through a panel discussion with six key speakers, World Cafe and Peer Review methodologies involving all participants. This consultative and participatory process during the workshop was based on a novel 5-P Framework – Problems, People, Processes, Partnerships and Policies – that APAARI introduced and that helped facilitate focused discussions. A stock of key problems in terms of people, processes, partnerships and policies was taken in the context of AIS, which helped formulate recommendations for policy and decision makers in governments, NARS institutions, higher education, bridging institutions and the private sector to make AIS perform more effectively.

It is envisioned that these recommendations will assist policy and decision makers in integrating the AIS perspective and the need to develop functional capacities at individual, organizational and enabling environment levels, in their mind sets, long-term innovation strategies and policy development. A draft policy brief has been developed and will be shared on the APAARI website shortly.



### APAARI-led webinar improves capacity of universities to engage agriculture students

On 4 June 2019, a 1.5-hour webinar on 'How to make agricultural lectures more interactive for agricultural students' was organized in collaboration with the TAP/FAO for professors and deans of TNAU, India, and other universities that expressed interest in learning about this topic. The webinar was facilitated and moderated by APAARI through Bluejeans platform. In total, around 220 people participated in the webinar from: 14 colleges of TNAU, Sardarkrushinagar Dantiwada Agricultural University (SDAU), CSK Himachal Pradesh Krishi Vishvavidyalaya, and Professor Jayashankar Telengana State Agricultural University (PJTSAU) all from India; University of Alberta, Canada; and Agricultural University of Nitra, Slovakia; as well as international organizations, including FAO and Global Confederation of Higher Education Associations for Agricultural and Life Sciences (GCHERA).



APAARI-TNAU Webinar 2019

The webinar enhanced the participants' capacity to deliver more interactive lectures and seminars to develop agricultural students' functional capacities (soft skills), such as confidence, critical thinking, creativity, collaboration and negotiation, thereby help them become more innovative and empowered in their future careers in agriculture and rural development. Specifically, the webinar aimed to enhance the participants' capacity to:

1. Develop more effective communication with students.
2. Integrate interesting ways of presenting and discussing module topics.
3. Interact with students and engage them in discussions.
4. Introduce interactive tools and materials.

APAARI brought together interesting speakers from around the world, to highlight this important topic and contribute to capacity development in the region. The following were the speakers:

1. Dr. Ravi Khetarpal – Executive Secretary of APAARI- Introduction
2. Dr. N. Kumar, Vice-Chancellor of TNAU – Welcome statement
3. Ms. Marriette Gross, Head of Training Programmes, International Center for Development-Oriented Research in Agriculture (ICRA) – Making education work: Motivating students to employ graduates
4. Dr. Dileepkumar Guntuku, President, AgTech Innovation Labs, Iowa State University, USA – AgMOOCs in Flipped Classroom to promote interactive learning in agricultural education; and
5. Dr. Tonette Laude, Assistant Professor, Institute of Crop Science, College of Agriculture and Food Science, University of the Philippines – It's fun to learn the science behind crops
6. Contribution of Dr. Frank Robinson, University of Alberta, Canada – The Game of Farm Life, Rural Café, and What's behind the barn door
7. Dr. John Kennedy, Dean- School of Post Graduate Studies, TNAU – Reflection

Insights on how to design sessions in such a way that students practice the skills in order to get a job were presented by Ms. Gross, who explored two questions "What do my students need to learn?" and "What approach should we use to achieve it successfully?" She presented key learning steps that need to be applied in the higher education to address key gaps and facilitate transition from classroom to real life. These are as follows: (i) explanation (to know); (ii) intermediary exercise (to understand); (iii) core exercise (to be able to do); and (iv) internship and other real life learning (to do).

Traditional versus virtual learning was presented by Dr. Guntuku. While traditional classroom learning offers a limited number of seats, virtual online learning programmes offer unlimited classroom size. Massive Open Online Courses (MOOCs) are online courses aimed at large-scale participation and open access through Internet, offering quality education to the most remote corners of the world; helping people further their careers, and expanding their intellectual and personal networks with strong communities.

Creative pedagogies in crop science were explored by Dr. Laude. She shared interactive techniques practiced by the University of the Philippines, such as getting to know the students, 'learning by doing' e.g. through teaching students identify morphological characters associated with productivity, adaptability and marketability; bio-intensive gardening; edible landscaping; and rooftop and herbal gardens. Combined with visits to learning laboratories, the university has integrated the perspective that higher education is all about students – what they learn, what they

experience and what they can apply.

Professor Frank Robinson, University of Alberta, Canada, has developed a number of innovative ways of engaging students through participatory learning in animal science, such as the 'Game of Farm Life' that engages animal science students in a reality show, 'Rural Café' that brings agriculture industry people and students together and let them sit and chat over coffee; and 'What's behind the barn doors', which shows "five different doors" opened by students with different questions and exercises.

All these examples of interactive learning that were presented in the webinar demonstrate that there are no limits to creativity. Increasingly, university professors show a creative potential through introduction of innovative interactive educative methods in curricula, which encourages maximal development of students and their preparation for real life learning experiences. APAARI, in collaboration with ICRA, FAO and other partners, will continue to bring tailored activities to its member universities that will develop this creative and innovative potential among professors in Asia and the Pacific. Such functional capacities are critical to facilitate successful careers of students after their graduation, and equip them with the skills they need to create agricultural jobs and sustainable agricultural development for future generations.



### ASTI shows progress in data collection on agricultural investments

The ASTI project that started in November 2017 is funded by ACIAR and jointly implemented by APAARI and IFPRI in Southeast Asia and the Pacific. Activities are taking place in ten countries – Cambodia, Fiji, Indonesia, Lao People's Democratic Republic (PDR), Malaysia, Myanmar, Philippines, Papua New Guinea (PNG), Thailand and Vietnam. As of May 2019, five countries – Cambodia, Lao PDR, Myanmar, PNG and Vietnam have completed data collection and related surveys. Preparations are underway to process, analyze and develop a series of research publications using the completed data.

Other countries have made considerable progress as well and are likely to complete data collection activities by the end of July 2019. The total of 383 agencies was surveyed and detailed data were collected on human resource, investment, research focus, and research output. Country reports will be developed with the focal points, and will describe the key trends, challenges, and policy implications emerging from the data.

All reports and national-level data will be made available on interactive country pages, benchmarking, and data download tools on the ASTI website: [www.asti.cgiar.org](http://www.asti.cgiar.org), as well as the ASTI page on the APAARI website.



### International workshop on germplasm health boosted commitments of the CGIAR genebanks and breeding programmes



CGIAR Gene Bank meeting participants

An international workshop on CGIAR Germplasm Health of the CGIAR Genebank Platform and the Crop Trust was held from 29 April to 3 May 2019 in Rabat, Morocco. Experts of germplasm from Germplasm Health Units (GHU) of CGIAR centres gathered together to review progress and identify challenges and opportunities. The event also served as a platform to update the phytosanitary framework for better alignment with genebank phytosanitary priorities. The meeting presented a 'GreenPass Protocol' developed to fast-track germplasm exchange, and promote cooperation with national plant protection organizations. Further, it developed strategies and an Action Plan 2020-2021 to improve germplasm health safety and phytosanitary compliance, thereby enhancing international commitments of the CGIAR genebanks and the breeding programmes.

Dr. Ravi Khetarpal, Executive Secretary, APAARI, presented phytosanitary challenges to germplasm exchange in Asia-Pacific. He particularly highlighted policy gaps of germplasm vis-à-vis the World Trade Organization (WTO) and Convention on Biological Diversity (CBD), which need to embed their norms in the philosophy of guiding principles of safe movement of germplasm. He stressed some key issues in germplasm exchange and quarantine, which need to be clearly spelled out in national legislations and guidelines for export and import certification.

He suggested a mechanism for global acceptance and implementation of GreenPass protocol. He also assured APAARI's support in enhancing the importance of CGIAR gene banks and germplasm exchange, particularly through awareness generation, policy interventions, and coordination with regional and global agencies.



## The 35th Tocklai Conference on SustainabiliTea shapes a roadmap for research in tea

The 35th Tocklai Conference on 'SustainabiliTea: Challenges and the Way Forward' was held on 22-23 February 2019 in Tocklai Tea Research Institute in Jorhat, Assam, India. The conference provided an excellent platform for scientific discourse and exchange of knowledge amongst scientists and stakeholders of the industry on the measures to cope with climate change challenges and their effects on tea quality, as well as challenges due to escalating costs of production and various mitigation strategies. The event also highlighted soil health management for sustainability, biotic challenges and moving towards ecological and sustainable pest management. Finally, it explored diversification in field and products, as well as regulatory challenges.

Dr. Ravi Khetarpal, Executive Secretary, APAARI, represented the Association to share its role in agri-food innovation systems. He stressed that addressing the complexity of the systems requires innovation in agriculture and rural development to be based on multi-stakeholder interaction, linkages with other sectors, such as human health, as well as consolidation of local, indigenous and formal scientific knowledge, viewing agriculture from multiple perspectives and disciplines, i.e. all the way from biological science to social, natural and policy research. He emphasized that deploying research and science for innovation and development requires capacity and strong links among users of research outputs, as well as innovative processes to make those links work. It also requires establishing effective partnerships based on trust among a broad set of actors extending beyond formal science and development. This necessitates coordination and collaboration among a diversity of actors, with the aim of harnessing new ideas and mobilizing resources from both public and private sources.



## CDAIS International Forum: Strengthening functional capacities to innovate



Participants of the CDAIS International Forum

From 13-14 May 2019, APAARI participated in the International Forum of the Capacity Development for Agricultural Innovation Systems Project funded by the European Union (EU) and implemented by FAO and



Participants of the TAP Steering Committee Meeting

Agrinatura in collaboration with global, regional and country partners. Over 120 participants representing farmers, researchers, scientists, development practitioners and knowledge intermediaries gathered in Gembloux, Belgium, to share experience and knowledge from this project's implementation.

APAARI actively contributed to two panel discussions: (i) on ideas and concepts behind the Common Framework developed by partners of the Tropical Agriculture Platform (TAP) – to gain deeper understanding based on the diverse contexts in which they have been applied by TAP partners; and (ii) on influencing actions and tracking commitment through the adoption of the Common Framework and related approaches at global and regional levels.

The Forum was organized in a very interactive way and engaged all participants in learning and sharing knowledge. This has led to sharing of ideas and visioning that has shaped a path for action on mainstreaming the strengthening of functional capacities in the development agenda at national, regional and global levels.

Prior to the Forum – on 12 May 2019, APAARI participated in the TAP Steering Committee, where progress was discussed against the TAP Action Plan. Following the Forum, APAARI also participated in the TAP Partners' Meeting on 15 May 2019, to jointly review the recommendations emerging from the Forum with other TAP partners. Specifically, the issues with ideas and concepts behind the Common Framework, implementation realities and evidence of change were revisited and validated, to provide more refined set of recommendations envisioned to drive innovation processes in food and agriculture.

All meetings provided an excellent opportunity for APAARI to engage with existing partners, such as FAO and the Forum for Agricultural Research in Africa (FARA), and other institutions, such as the EU, CIRAD and GFRAS, with which APAARI has initiated dialogue on collaboration and partnership in Asia-Pacific.



## APAARI kicks off its transformative actions in agricultural education – A pilot activity with Tamil Nadu Agricultural University in India

From 23-25 January 2019, APAARI conducted Training on Transformation of Agricultural Education through Knowledge Management and Capacity Development for More Effective Agricultural Innovation System (AIS) for professors, administrators and PhD students of the Tamil Nadu Agricultural University (TNAU). It was organized in collaboration with FAO, and Global Confederation of Higher Education Associations for Agricultural and Life Sciences (GCHERA) in Coimbatore, India.

The workshop developed participants' knowledge of the key concepts and processes of the common framework on



### *Training workshop participants in TNAU*

Capacity Development for Agricultural Innovation Systems (CD for AIS) and knowledge management (KM), to guide transformation of agricultural education in order to develop students' skills needed by the market to enable them to better address the complex agri-food challenges after their graduation.

Building on the academic model of the EARTH's University in Costa Rica that has influenced university reforms all over the world, the participants learned about the key elements of successful transformation of agricultural education systems, such as bringing business, ethical and value-based leadership and experiential development to agricultural universities.



*Presentation by a workshop participant*

During the workshop, the facilitators used the concepts, tools and approaches of the Common Framework on CD for AIS, to take stock of TNAU's current and desired KM and CD practices, develop the university vision with supportive objectives, identify and discuss their key functional capacity needs, and helped them design their own roadmap towards the university transformation. Innovation champions from the university were also identified to help APAARI and its partners to promote university reforms and keep track of the progress.

APAARI, with support of the Tropical Agriculture Platform (TAP) hosted by FAO in Rome, Italy, committed to a number of follow up activities to provide a post-workshop support to TNAU. As such, APAARI conducted a short survey to identify immediate needs of TNAU staff to inspire their transformation from teachers into leaders that promote career development in agricultural professions. The most highly ranked need identified in the survey was to “Make university lectures and seminars more interactive” that fed into a webinar with experts. A draft concept note on integration of the Common Framework to University Curricula was prepared, and a study on tertiary perspectives on AIS was conducted.

APAARI is actively scoping for resources to deliver more capacity development activities, the progress of which has been monitored in the context of its agricultural education programme, to provide evidence on the value of developed functional capacities (soft skills) for the higher education sector and ultimately the AIS.



## NEWS UPDATE FROM NARS

Agricultural Research Education and Extension  
Organization (AREEO), Iran

# Imam Khomeini Higher Education Center: The ecosystem of entrepreneurship and innovation for agribusiness startups

Development of the agricultural sector plays a vital role in economic development of Iran. Agriculture has a significant contribution to GDP, employment, non-oil exports and sustainable food security in the country. However, this sector, considering its environmental and non-environmental constraints, faces various socio-economic challenges. The dissemination of compatible and native innovations and technologies, and development of agribusiness startups, would be an effective way to resolve part of existing problems and challenges.

In Iran, policies and tools to support innovation, business and entrepreneurship development, especially in the agricultural sector, are limited since attention has started to be paid to this area only in recent years. Due to the various

financial, capacity, advisory, and legal needs of innovators, creation of an agricultural entrepreneurship and innovation ecosystem to develop entrepreneurial activities and launch startups has become increasingly popular.

In 2014, the Imam Khomeini Higher Education Center (IHEC) was launched as one of the leading centers in the field of agricultural education and entrepreneurship. It has made efforts to create a dynamic entrepreneurial and innovative regional ecosystem with cooperation of the private sector.



*IHEC campus (Source: AREEO)*

The main goals are to:

1. Promote and develop agribusinesses startup to promote employment and entrepreneurship.
2. Provide a variety of educational, consulting and commercial services for agribusinesses startup.
3. Identify, empower and employ entrepreneurship facilitators and strengthen the network of agribusinesses startup.
4. Model plans of development of agribusinesses startups and transfer them to other public and private organizations and institutions.

The center has several unique features such as proximity to Tehran's highway, its populated market, and the relatively advanced agricultural area of the Alborz province; access to laboratories and conference and accommodation facilities, which makes it an idea place for the development of entrepreneurship and innovation ecosystems.

The Center's ten-year development plan for this ecosystem follows four key steps with specific activities: (i) organizational reform towards entrepreneurship organization; (ii) creation of infrastructure, such as Science and Technology Park, greenhouse sites, agribusiness spaces and Agricultural Innovation and Acceleration Centre; (iii) Innovation and Entrepreneurship Culture-building through events, workshops, capacity development and advertising; and (iv) supportive plans for projects and financial and legal support.

Currently, the ecosystem provides the following services to applicants in the areas of food and agriculture startups:

1. **Networking:** Communication system between startup teams and a network of agricultural coaches,



*Modern farm and greenhouse of IHEC (Source: AREEO)*

consultants, investors and experts, and even customers and applicants has been created.

2. **Consultation, coaching and training:** A variety of consulting, coaching and training services are provided for agricultural startups. The network of advisers and coaches also brings business from idea to execution and fundraising.
3. **Co-working space and infrastructure facilities:** Office spaces and laboratories will be allocated to the accepted teams. Workshops facilities, labs and other amenities are provided at a low price for startups.
4. **Pre-seed and seed funding:** The ecosystem helps startups with fundraising. In cases of successful agribusiness startups, the ecosystem provides initial capital and diverse services through the network of investors. It covers the initial costs and helps to get the product manufactured and made available to customers.



*Agribusiness located in IHEC (Source: AREEO)*

The IHEC ecosystem targets various actors for the delivery of its services. This includes: managers and senior experts of agricultural organizations, activists in the field of agricultural startups (students, graduates and agricultural entrepreneurs), large agricultural companies that are the main sponsors and include public-private partnerships, private sector investors, and mentors who have the knowledge and expertise for launching startups.

With support of the Ministry of Agricultural Jihad and the Agricultural Research Education and Extension Organization (AREEO), the ecosystem has been able to empower a significant number of students, graduates and agricultural employment enthusiasts to set up agribusiness. In this regard, improving the knowledge and skills of agribusiness managers and experts, and strengthening and supporting

the private sector for the launch and development of startups, are part of the benefits of this ecosystem. As such, the Center is envisioned to create independent, strong and sustainable startups and businesses in the agricultural sector, and space for operating agricultural innovations.

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**National Agriculture and Forestry Research Institute (NAFRI)**

### **20<sup>th</sup> anniversary of agriculture and forestry research development**

Being established in 1999, the National Agriculture and Forestry Research Institute (NAFRI) in Lao People's Democratic Republic (PDR) has celebrated its 20<sup>th</sup> anniversary on 25-28 April 2019. The celebrations started with an official ceremony chaired by His Excellency Vice Prime Minister of the country. It continued with a reward ceremony to 24 most outstanding researchers for their 20-year achievement. An international seminar on agriculture and forestry research development was held on the same day, covering over 20 topics in four thematic sessions, and concluded with discussions about the way forward for Lao agriculture and forestry research.



*Lao agriculture and forestry research award (Source: NAFRI)*

NAFRI took this opportunity to open its Agriculture and Forestry Learning Garden, which is open to public for learning about current practices in agricultural development. Visitors can learn about agricultural production and technological advances demonstrated on a two-hectare area, such as selected rice varieties in different plantation areas, cash-crop varieties, fishery technologies, and horticultural plantation techniques. Part of the event was the Agricultural Fair and Exhibition with around 70 exhibitors, such as smallholders and SMEs, demonstrating links between agricultural research findings and commodities.

During its 20-year existence, NAFRI has gained a lot of critical experience, qualification of staff, and professional

achievements contributing to Lao agriculture and forestry development. Such key achievements include, for example, seed variety collection and improvement, animal breeding, and new technology application to increase yields and reduce labour costs.



*High level government guest's field visit in agriculture and forestry learning garden (Source: NAFRI)*

An important case study shows how research findings were applied in farmer's agriculture production in Xiengnang District, Luangphabang province, after using forage variety improvement and livestock feeding technology in 2005. By today, these farmers increased their income and improved their livelihood by farming 367 buffaloes, 1,100 cows, and 225 goats in 34 households. Many villages around these target farmers benefit from exchanging experiences and buying forage species from them.

NAFRI's agricultural and forestry research for rural development is driven by its Vision 2030 and Research Strategy 2025 through four research programmes: (i) sustainability and utility of agro-biodiversity; (ii) improvement of agricultural productivity; (iii) agriculture adaptation to climate change; and (iv) agriculture and forestry economic rural development research. The two support programmes include: research capacity development, and information and communication. These key framework areas are well supported through collaboration with regional and international partners and contribute to the National Economic Plan and Agriculture Development Strategy Plan 2025.

In order to achieve its strategic objectives, NAFRI needs to address some key challenges it is facing, such as limited research investment and facilities. It considers necessary to work more closely with international agencies and development partners, as well as with the private sector to improve technologies and varieties, and agricultural extension to bring new technologies and research results to expansion of agriculture production.

On other hand, it is necessary to listen and get feedback from the farmer community that is adapting new technologies or varieties in the field. Working with extension workers can also provide appropriate options for farmers and help identify the need for new technology development.



## Professor Jayashankar Telangana State Agricultural University (PJTSAU), India

### AgriVision 2019

The Professor Jayashankar Telangana State Agricultural University (PJTSAU) in India organized a conference on 'Envisioning Agro Solutions for Smart and Sustainable Agriculture' (AGRIVISION-2019), in collaboration with the Confederation of Indian Industry (CII) and Cornell University, USA. It took place from 17-18 January 2019 in Hyderabad, India. About 200 participants consisting of senior officials from government, apex institutions, international agricultural research, academia, private companies, as well as progressive young farmers from Telangana, took part in the conference.

The objectives of the conference were to discuss innovation trends in technologies, best practices and case studies, agro industry needs and issues, policies of the state and central government, incentives and support availability. It also explored the challenges of the global market and export competitiveness to create a robust agri-value system able to address different obstacles in the Indian agriculture sector. Finally, it facilitated stakeholder networking to stimulate agricultural innovation and encourage technology up-gradation through research and development (R&D) as a way to ensure food and nutritional security.

The Honorable Vice President of India – Shri. M. Venkayya Naidu – inaugurated the conference, calling for policy and innovation-based technological support to farmers for making farming a remunerative occupation, while providing them with the tools to sustain the climate change and market fluctuations. Several distinguished speakers from industry and academia shared their insights and experiences during the eight technical sessions on topics, such as combating climate change; agriculture based on 'internet of things' (IOT) and artificial intelligence (AI); economics behind enhancing farmers' income; advances in horticulture and animal-based agricultural systems; post-harvest management and value addition; innovations, success stories and research work applicable to South Asia; and technology in agri-entrepreneurship.

Key learning and recommendations that emerged from

the conference include:

- Investment needs to be made in developing drought-heat- and deluge- tolerant crop varieties to withstand future climate change effects; genome editing in rice (CRSPR /Cas9) and other crops for yield improvement; abiotic/biotic stress tolerance; and nitrogen use efficiency and senescence.
- Farmer participatory conservation agriculture practices complemented by policies and supporting environment-friendly technologies need to be widely promoted. Government policy support for infrastructure, crop corridors, and targeted climate smart agriculture initiatives was also emphasized.
- AI technologies need to be widely adopted, enabling data-driven decisions to improve agricultural yields, lower overall costs, and reduce the environmental impact of agricultural production. Synergy needs to be achieved between various IOT tools, such as drone-driven tractors, smart scanning, sampling sensors, agricultural robots, to enable precision agriculture, block chain technology innovation in the supply chain, and marketplace for producers and consumers. Startups for precision diagnostics through AI based tools should be promoted with critical consideration of IPR issues.
- Collectivization of farmers can effectively address the issue of smallholdings and seek alternative mode of financing. The cluster approach facilitates capacity development in operations, introduction of new products, and transformation of farmers into agripreneurs. The importance of capital formation in agriculture and its contribution to agricultural growth was also reiterated.
- A three-pronged approach focusing on primary processing, improvement of the holding capacity of farmers, and processing into retail or end products with enhanced participation of the private sector, needs to be adopted to ensure remunerative returns to farmers. A suitable policy environment needs to be in place to ensure participation of corporate sector in agri-logistics, processing and marketing.
- Focused action in food processing, cold chain and food safety with key stakeholders to avoid storage losses and wastages has been considered the top priority. Various trends, such as the use of biodegradable material in packing in place of non-degradable plastic, benefits of preserved/frozen food over fresh food, intervention in agri-processing industry, and marketing linkages for better returns to agricultural producers were discussed.
- Changes in agricultural curriculum were proposed to reflect the changing needs and appropriate skill development in the technical manpower to promote smart but sustainable farming. R&D on product or process development, prototyping and scaling-up, market analysis, safety, nutrition and business plan development, have to become part of education to empower student entrepreneurship and agricultural

innovation at universities. The Cornell initiative in Afghanistan was presented as an example of international cooperation in capacity building for food product development, preservation and safety.

- The integrated farming system models need to be promoted to improve income levels of small and marginal farmers, and development of small enterprises to boost income in areas such as: backyard poultry, desi breeds, small ruminants production systems, mushroom production, apiculture, sericulture, Spirulina farming, millet processing units and value addition branding.
- Discussions on global technology trends in horticulture and importance of alternative agriculture systems in providing food security threw emphasis on tunnel and high tunnel technologies for furrow and terrace/trellis planting of high value crops by small farmers.
- Animal agriculture was emphasized for meeting people's protein needs through large scale opportunities for export. For example, shrimps farming and the use of pre- and probiotics, and enzymes for increased egg production in poultry.
- The role of women as change agents for drudgery reduction and new agricultural technologies, ensuring gender equality in income and land ownership through appropriate policy interventions was also emphasized. The success story of Mulkanoor Women's Cooperative Dairy in Telangana was seen as an adoptable model for women empowerment across the country.



*The opening of the AgriVision 2019 Conference  
(Source: PJTSAU)*

The highlight of the conference was the sharing of success stories and experiences by progressive farmers from Telangana on agri entrepreneurship in India in diverse agricultural areas. These included: drip irrigation in rice, integrated farming with innovative marketing strategies, high density mango production, community supported agriculture, pesticide free greens/salads and rice cultivation, commercial scale protected cultivation of chilli in a tie up mode, rain water harvesting, poly house cultivation of cut flowers, mechanization of flower picking using robotics, and dairying with desi cows. The farmers were able to put forward real time issues and possible solutions for overcoming them through digital and policy interventions, stimulate participants' engagement, and network with other farmers and practitioners to exchange ideas.

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**Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD)**

### **Goat FIESTA convenes goat raisers and meat processors**



*(From left to right) Edwin C. Villar, PCAARRD Deputy Director; Gerardo A. Noveras, Aurora Governor; Fe L. Posciuncula, Director, CLAARRDEC Consortium; and Noel Ponciano Soliman III, Local Government Unit (LGU) of Tarlac veterinarian (Source: PCAARRD)*

Inspired by the success of its Farms and Industry Encounters through the Science and Technology Agenda (FIESTA) for goat last year in Balanga City, Bataan, Philippines, the Central Luzon Agriculture, Aquatic and Natural Resources Research and Development Consortium (CLAARRDEC) conducted its 2nd Goat FIESTA, this time in Baler, Aurora, Philippines. FIESTA is an event-based technology promotion and transfer modality initiated by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development of the Department of Science and Technology (DOST-PCAARRD) to enhance the transfer of technology from the laboratory to their intended beneficiaries.

The Goat FIESTA event held from 25-26 April 2019 brought together goat raisers and meat processors in a bid to achieve a more productive, competitive, and sustainable goat production system in the province of Aurora and Central Luzon. Three hundred twenty goat farmers from Dingalan Maria Aurora, Dipaculao, Casiguran, Dilasag, San Luis, and Baler attended the event. With goat being a sunrise industry in Aurora province, the Small Ruminants Center and the Office of the Provincial Veterinarian have intensified their partnership to improve goat production through joint Farmer Livestock School on Goat Enterprise Management (FLS-GEM)- a participatory training approach for livestock farmers.

Goat FIESTA 2019 showcased technologies, such as artificial insemination, delivery protocol, different feeding schemes, and supplements for the various physiological stages of



Goat contestants with their owners during the Goat Show  
(Source: PCAARRD)

goat, farm machineries and implements, mastitis kit, test interval method for data milk collection, and FLS-GEM. With focus on technology transfer, the event included technology pitching on topics, such as meat processing as a business, goat as a sunrise industry, forage-based pellet feeds, and mastitis kit.

The event also featured the success stories of three goat raisers – Mr. Samuel J. Sardenia, Mr. Nuevo M. Villanueva, and Mr. Ciriaco B. Soriano, from Balungao, Pangasinan – who talked about the rise of goat business through goat upgrading; goat ‘paiwi’ in the villages; and grazing meat goats for slaughter. The three men converged on one point – their adoption of learning from FLS-GEM that contributed to their success.



70-year old Samuel J. Sardenia sharing his success story  
(Source: PCAARRD)

FLS-GEM’s participatory approach provides farmers with production and enterprise management options that are the most suitable for their capacity. “With FLS-GEM, I was able to upgrade my goats and now they have higher body weight,” Mr. Sardenia mentioned. “I can sell them for P5,000.00 each at its lowest selling price after 6-8 months and for P10,000.00 after a year at its highest selling price,” he added proudly. Mr. Sardenia was the champion of the Balungao Goat Festival for having produced the best buck and doe in 2016.

The participating goat owners showed off their goats in a display of grace, size, and stature to promote technologies in goat production and management. Clad in colorful and

fanciful costumes, 20 selected goats, representing the different municipalities and agencies in Aurora province, ramped before the judges and hundreds of goat farmers. The goats were judged based on their costume, breed conformity, size and stature, and audience impact.

The event also gathered the gourmets of Baler with the conduct of AgriSarap: A culinary arts festival based on chevon (goat meat from adults). Meat processors from eight municipalities participated in this activity. Composed of three representatives per group, each group was tasked to prepare Caldereta (goat meat stew), Papaitan (a soup dish), and Kilawin (a goat skin appetizer) highlighting chevon as the main meat ingredient.



A participant cooks chevon caldereta during the FIESTA's cookfest. (Source: PCAARRD)

The cookfest was conducted to promote R&D value adding initiatives as part of the technology promotion and transfer effort of PCAARRD. Other activities included an On-the-Spot Poster-Making Contest and Palarong Kambing, which added color and merriment during the event with a true FIESTA celebration.

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**Vietnam Academy of Agricultural Sciences (VAAS), Ministry of Agriculture and Rural Development (MARD)**

**Enabling production and application of bio-products for soil-borne disease control and organic farming in Asia**

The main characteristics of conventional “intensive and chemical agriculture” are high inputs of chemical fertilizers and pesticides (agrochemicals). In the last decades, intensive use of agrochemicals has increased the toxicity in soil and degraded its health. This led to an increase in plant diseases and other pest problems. Soil-borne diseases are considered

one of the major factors contributing to low yields of agro-products. Most soil-borne pathogens are difficult to control by conventional strategies, such as the use of resistant cultivars and synthetic pesticides.



Participants visiting the Organic Vegetable Farm (Source: VAAS)

Thus, biological control has become a critical component of plant disease management and it is a practical and safe approach in various crops. Bio-protectants provide a unique opportunity for crop protection and for sustaining the quality of degraded soils due to the intensive use of synthetic chemicals for increasing crop production. The use of bio-agents as bio-fertilizers or bio-pesticides is an integral part of organic farming, one of major tools for sustaining the soil quality degraded by synthetic chemicals, as well as suppressive measure to soil-borne pathogens and their root diseases.

An international workshop on “Enabling capacity in production and application of bio-pesticide and bio-fertilizer for soil-borne disease control and organic farming” was held on 7–9 May 2019 at the Vietnam Academy of Agricultural Sciences (VAAS) in Hanoi, Vietnam. The workshop gathered 80 experts, scientists, researchers and other participants from universities, research institutions, governments, international organizations, and the private sector of ten Asian countries. It was also attended by decision-makers from national and provincial government agencies, representatives of farmers’ groups and cooperatives, and other stakeholders in Vietnam.



Participants visiting the compost organic-farm production plant (Source: VAAS)

The event was organized by the Food and Fertilizer Technology Center (FFTC), an organization that facilitates knowledge exchange among research centers in Asia to

learn from each other and craft actionable solutions that will benefit smallholder farmers.

“The workshop is a huge opportunity for Asian countries to review current status of soil-borne diseases problems and share the relevant and useful experience in soil-borne diseases management as well,” said Dr. Kuo-Ching Lin, Director, FFTC, in his opening remarks. “We hope this kind of event will also help transfer innovative bio-technologies and bio-products, which can be applied for soil-borne disease control and organic farming to the agricultural community in the region” he pointed out.

The event was co-organized by VAAS – Vietnam’s leading premier agricultural academy. “No single research institution working alone can address the critically important issues of soil-borne disease control and organic farming,” said Prof./ Dr. Nguyen Hong Son, President of VAAS in his welcome remarks. “We are expecting that this workshop not only aspires to bring together lessons learned but also promotes lateral thinking, creating new ideas to point future research programmes,” he added.

Twenty-five papers were presented by international speakers from France, India, Indonesia, Japan, Korea, Malaysia, Philippines, Taiwan, Thailand, and Vietnam. The three thematic areas of the meeting focus included: soil-borne diseases, their management and control strategies; production potential and utilization demand of bio-pesticide and bio-fertilizer for soil-borne disease control; and innovative bio-technologies or/and bio-products for soil-borne disease management/control and organic farming.

The speakers highlighted the current status of soil-borne diseases problems that they found in some Asian countries and shared their country experiences in soil-borne diseases control and management for annual and industrial crops, and fruit trees. They also presented the potential of biological products for an organic approach to control the dominant soil-borne plant pathogens and emphasized the importance of the microbial quality of commercial bio-fertilisers and bio-pesticides. Furthermore, innovative technologies and bio-products, which can be adopted for soil-borne disease control and organic farming, were introduced by speakers from Japanese and Taiwanese companies.

A field trip to Organic Vegetable Cooperative in Thanh Xuan commune, Soc Son district, Hanoi, was organized on the last day of the meeting. This is one of the few certified organic vegetable production areas using the Participatory Guarantee System (PGS) over the last ten years, and the most sustainable PGS model in Vietnam. Participants visited a community organic farm where they met the cooperative manager and local farmers, and were introduced to cultivation and certification process of organic vegetables. They also learned how to successfully apply standards of producing organic vegetables recognized by the Vietnam

PGS Organic Standards. Participants then visited a compost organic farm production plant where they learned about the mechanical application of Uchishiro soil bacteria that is imported from Japan for producing organic fertilizer.

"The diversity of the participants, representing a wide scope of stakeholders in the field of plant protection and organic agriculture reflects the importance of the issues to be addressed," said the President of VAAS in his closing remarks. "The participants' active and cooperative participation in the workshop made it a big success. We are expecting that this spirit of cooperation would continue during the important work that lie ahead of us" he pointed out.

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**Department of Agriculture (DOA), Thailand**

**International training on nematodes as biocontrol agents**



*Mr. Danai Narkprasert, Director, BRDO/DOA, Thailand, opened the training (Source: DOA)*

On 31 January 2019, the Biotechnology Research and Development Office (BRDO), Department of Agriculture (DOA), Thailand, organized a ten-day International Training Course on Nematodes as Biocontrol Agents. A total of nine participants from Cambodia led by the Deputy Director of the General Directorate of Agriculture (GDA), Cambodia, attended the training.

The training course consisted of lectures and hands-on practices delivered by Dr. Nuchanart Tangchitsomkid, Senior Expert of Microbiology, BRDO/DOA. The curriculum of the training included the introduction to entomopathogenic nematodes, soil sampling and isolation of entomopathogenic nematodes, entomopathogenic nematode production process, separation of the produced nematodes, insect pests cause damages to vegetables, and the use of nematodes for control insect pests.



*Training participants (Source: DOA)*

Field visits were also arranged for the participants to observe smart farmer's fields in Ratchaburi and Ayutthaya provinces in the central part of Thailand. The training course was one of the capacity building programmes aiming to strengthen collaboration with neighboring countries to promote biological control approach as an alternative to reduce reliance on chemical control in pest management and contribute to sustainability of ecosystem.

*Source: Biotechnology Research and Development Office, Department of Agriculture (DOA), Thailand*



### **PROFILE:**

#### **Federation of Seed Industry of India (FSII)**

The Federation of Seed Industry of India (FSII) is a 40-member association of research and development-based plant science industry, engaged in the production of high-performance quality seeds for food, feed and fibre in India. Alliance for Agri Innovation (AAI) is a special interest group of FSII, working towards accelerating agricultural growth by promoting new and emerging technologies including using focussed plant breeding, transgenic trait development, enhanced seed technologies and gene editing. FSII-AAI members include both global (17) and domestic (23)



*AAI is a special interest group of FSII, working on promoting agriculture technologies*

companies that account for nearly 50% of seed industry in India and contribute to approximately 70% of seed research and development expenses in the country. It is driven by the fundamental value of investing in research to create sustained value for the farmer by bringing forward innovative products/solutions and respecting the intellectual property of each other.



FSII-AAI's focus areas (Source: FSII)

The focus of the Association is to serve as an interface between Indian seed and agri-biotech industry and other stakeholders including the government, farmers and like-minded associations. To achieve its goals, FSII-AAI and its members collaborate and engage closely with farmers, seed companies, rural communities, regulatory authorities, policy makers, government officials, scientific community, grower organizations, NGOs and other diverse stakeholders to create an enabling environment for the growth of research-based seed industry. FSII-AAI explores ways to encourage partnerships within India and with other countries and organizations that may benefit Indian farmers through the development and introduction of modern science and technology. The Association also works with regulatory bodies and the government on value-creation projects, such as building public confidence in the Indian regulatory system that will bring forward technological solutions to the issues of agriculture and associated industry.

The Association also brings its policy position papers and engages in policy advocacy work to strive for predictable protection of intellectual property (IP) generated through innovation that will provide long-term benefits to Indian farmers.

FSII-AAI is also working on a cross-industry IP strategy and has aligned with end user industry (textile and feed) for promoting a holistic approach to agricultural policy. The Association's member companies are committed to increased research investment in India and have been engaged in bringing out innovative products, including hybrids and traits.

Source: Ratna Kumria [ratna@agriinnovation.in](mailto:ratna@agriinnovation.in)



## Australian Centre for International Agricultural Research (ACIAR)

### Seeds of Change

The world's first international agricultural research-for-development gender conference was held at the University of Canberra, Australia from 2-4 April 2019. 'Seeds of Change: Gender equality through agricultural research for development' was co-organised by the Australian Centre for International Agricultural Research (ACIAR), the University of Canberra and CGIAR Collaborative Platform for Gender Research.

The conference brought together 280 experts, scholars and researchers from 45 countries, showcasing cutting-edge research on gendered social relations in the sector and providing several valuable networking opportunities, both face-to-face and via the conference app.

"Whether we are talking about regional or rural Australia or low- and middle-income countries, greater attention to gender equity and the empowerment of women has been proven to accelerate poverty reduction," said conference co-convenor and ACIAR's gender expert Dr. Jayne Curnow.



Vicki Wilde from the Gates Foundation, Dr. Jayne Curnow from ACIAR, and Dr. Jemimah Njuki from the International Development Research Centre (Source: ACIAR)

The conference attracted a fair bit of media coverage, despite it coinciding with the much-anticipated Australian federal budget announcement (a precursor to the announcement of a federal election). As well as several gender blogs and DevEx publishing reports from the conference, a radio interview with Dr Curnow was broadcast right across Australia on commercial networks' news bulletins; the national broadcaster ABC recorded the guest lecture by Professor Naila Kabeer, and keynote speaker the Gates' Foundation's Vicki Wilde was interviewed live by one of the ABC's flagship radio current affairs shows. One hundred percent of conference participants who answered the survey said that they would like to see another gender-in-agriculture conference, with 97 percent of respondents reporting to be very satisfied or satisfied with the conference as a whole.

Seeds of Change sold out months in advance, but those unable to attend could follow the keynotes, plenary sessions and guest lecture live on ACIAR's YouTube channel. They remain curated there in the 'Seeds of Change' playlist, along with interviews with 20 key conference participants (see <https://www.youtube.com/user/ACIARprojects/playlists>). They can also be accessed online via the Seeds of Change page on ACIAR's gender portal, along with all the presentations (see <https://co-lab.aciar.gov.au/seeds of change/>). CGIAR has also curated conference materials and news reports on its website.

International participants at Seeds of Change gained an invaluable appreciation for the original custodians of Australia's land. From the Indigenous galleries tour, the Indigenous menu and the Welcome to Country by Ngunnawal Elder Aunty Violet Sheridan at the opening dinner at the National Gallery of Australia, to the Indigenous smoking ceremony following the concluding 'provocations' plenary, the conference's co-sponsors paid their respects to the Ngunnawal people, the traditional owners of the land upon which the conference was held.

Professor Naila Kabeer, the renowned feminist development economist from the London School of Economics, said the conference was an eye-opener for her. "I came here to learn about the researchers' field-based challenges... and found that gender is really struggling to get acknowledgment as an issue. Whereas I thought it would have been an obvious one." Indeed, said Professor Kabeer, agriculture itself can be sidelined in the broader economic policy debate, but this is changing: "Growing attention to climate change and the environment is bringing home to people how important it is to conserve our natural resources, and in that conversation, agriculture is very central."

Indeed, along with intersectionality, climate change was identified by survey respondents as a topic that requires more attention in any future gender-in-agriculture conference.

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**International Center for Agricultural Research in the Dry Areas (ICARDA)**

### **Lentil in South Asia: The impact of partnership between ICARDA and national partners**

Pulses are versatile crops that are crucial staple in South Asia. Yet, Bangladesh, India and Nepal suffer from a deficit in their production to feed their population. Among majorly grown pulses in South Asia, lentil is important in Bangladesh,

Nepal and eastern Indian states. In these countries together, lentil is cultivated on 2.03 million ha with a production of 1.64 million tons and a productivity of 1.2 tons/ha.

Lentil, usually served as dhal (a concentrated soup) with rice a popular rice-lentil dish, is considered "poor man's meat" in South Asia because of its high protein content. It is also rich in micronutrients, including Fe, Zn and β-carotene, essential for human health, which is crucial to the diet of the poorer segments of the societies. Its straw is a valued animal feed, and lentil planted in rotation with rice saves nitrogen fertilizer, improves soil fertility and helps break pest and disease cycles. Lentil is generally grown as a sole crop after monsoon rice and jute, mixed and inter-cropping with other compatible crops. Recently, lentil has been promoted in rice-fallow lands in South Asia to break mono-cropping and to intensify rice-based production system.

Through partnership and quality science, the national programmes of South Asia and the International Center for Agricultural Research in the Dry Areas (ICARDA) jointly developed improved varieties through genetic enhancement by utilizing exotic genes. Lentil is one of the key mandate crops of ICARDA assigned by CGIAR. The partners developed early maturing, high yielding and disease-resistant varieties along with matching production packages that have met with eager acceptance from South Asian farmers.

ICARDA is working with its partners to establish lentil in a cropping system mode instead of a single commodity in the production systems. ICARDA holds >12,000 accessions of primitive landraces, wild relatives and breeding lines of lentil. These are considered as the major building blocks, and are being shared with South Asian national programmes through international nursery network. The Bangladesh Agricultural Research Council (BARC), Indian Council of Agricultural Research (ICAR) and Nepal Agricultural Research Council (NARC) are the key partners in lentil R&D activities in the region.

### **Overcoming an ancient bottleneck for genetic enhancement**

Due to the difference in the flowering time between South Asian local germplasm and those of exotic origin from ICARDA germplasm, it was not possible to cross the two to incorporate exotic genes. This "ancient bottleneck" was broken through the introduction and use of parental material from ICARDA in a hybridization programme. In consultation with national breeders, crosses are planned and made at ICARDA under extended photoperiod (18 hours plus) to improve synchrony in flowering and facilitate crossing with South Asian landraces.

Targeted segregating populations developed at ICARDA were sent to the national programmes for local selection. Through this approach — breeding for synchrony followed by wide crosses — desirable genes were introgressed,

including disease resistance, and the genetic base of lentil was substantially broadened. This amounts to a major breakthrough in the field of plant genetics and shows how partnership between national agricultural research system and a CGIAR center (ICARDA) can leverage impact on agri-food systems.

Following this strategy, targeted segregating populations were developed with genes for earliness, high biomass, disease resistance, suitability to mechanical harvest and high micronutrient. These were provided to national programmes and selections were made under local conditions. This approach, along with direct selection of ICARDA's advanced lines and using the Center's genetic stocks as parents, has resulted in the release of twelve improved varieties in Bangladesh, 13 in India and ten in Nepal. These varieties are being up-scaled under various national and international schemes. With cultivation of improved varieties along with appropriate agronomy, productivity has increased from <0.8 tons/ha to 1.2 tons/ha in the last decade.

### New niches identified and explored

Appropriate improved lentil varieties are grown as sole crop, intercrop or mixed-crop. For example, Barimasur-4 and Barimasur-5 lentil varieties are suitable for intercropping with sugarcane and mustard in Bangladesh; and Moitree lentil variety in India. These varieties also performed well in agro-forestry system in Mango/Guava orchards having less shading effects in north-western Bangladesh and mid-region of West Bengal state of India.

To enhance global food production of the country, ICARDA and its NARS partners worked to intensify the rice-fallow lands in over 14.3 million ha in South Asia, which remains empty after rice harvest. By breaking rice-monocropping and increasing cropping intensity, lentil as a short-duration crop is highly suitable in this scenario. By using relay cropping techniques, as well as developing early-maturing, high yielding and multiple disease resistant varieties, lentil production increased significantly in the region. Yields as high as 1,225 kg/ha lentil were harvested in fallow lands, an add-on production from empty land. Early maturing (<110 Days) lentil varieties like Pusa Ageti, Moitree, HUL-57, Khajurah-2, Sikhar, Barimasur-4,-5-7 have been identified to cultivate under rice-fallow mono-cropping system.

Improved agro-technologies included seed priming, application of lime and boron in acid soils, a higher seeding rate (50 kg/ha), rice harvest 20 cm above ground level, Rhizobia and fungicide seed treatments, and application of insecticides and fertilizer. Besides, in rice-rice cropping pattern, which is a traditional system in eastern India, Bangladesh and eastern Nepal, super-early lentil can be introduced in a new rice-lentil-rice pattern. The recently released first super-early lentil variety of lentil globally, "Barimasur-9" in Bangladesh, which matures in <90 days with a yield potential of 1,520 kg/ha has successfully been cultivated in rice-lentil-rice system as relay crop. The variety has been developed through a cross between a Bangladeshi landrace, ILL 5888 and ILL 6002 done at ICARDA. As the plant canopy is very short with less branching, a seed rate of 60 kg/ha has been recommended. In case of late rice harvest (late November/early December), varieties with late-planting potential varieties are essential. The variety "Barimasur-8" in Bangladesh is suitable for this scenario.



*Lentil grown in rice fallows in India (Source: ICARDA)*

### Biofortified lentil varieties are available to consumers

Micronutrient malnutrition is rampant in South Asia, where more than 47 per cent of women and pre-school children are affected by "hidden hunger" due to micro-nutrient deficiency. Through genetic improvement, NARS and ICARDA scientists have developed micronutrient-dense lentil varieties with high Fe (>75 ppm) and Zn (59 ppm), which are under cultivation across these countries. The Bangladesh Agricultural Research Institute (BARI) released Barimasur-5,-6,-7,-9; Grain Legume Improvement Program; Nepal released Khajurah-1, Khajurah-2, Chital, Blackmasuro, Khajurah-4; and the Indian Agricultural Research Institute (IARI) released Pusa Vaibhav and Indian Institute of Pulse Research (IIPR) released IPL-220. These Fe and Zn-rich varieties are grown across these countries and available to consumers.



*Farmers in Bangladesh with Barimasur-7 lentil variety (Source: ICARDA)*

### Initiative on technology up-scaling and adoption

Improved varieties and production technologies have been practiced by farmers through various interventions. ICARDA in partnership with national programmes implemented various development projects, namely with the Food Security Mission of the Government of India,

OCP Foundation, International Fund for International Development (IFAD), OPEC Fund for International Development (OFID), HarvestPlus, and other national schemes, which resulted in adoption of improved technologies. The partnership gave researchers, extension agents, and progressive farmers formal training on the new lentil technology package. Details of the production packages were also made available in the form of leaflets, booklets, and posters in local languages. Farmers' field demonstrations and field days were also organized.

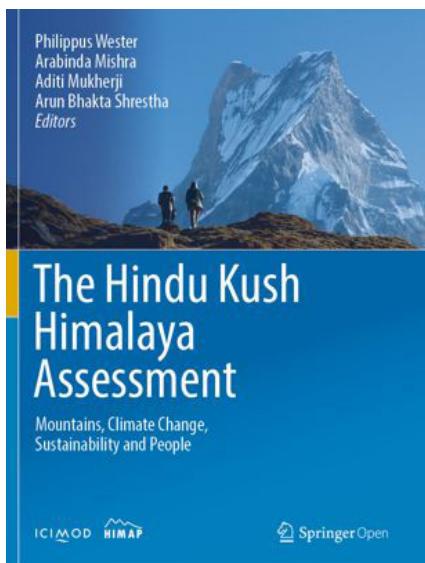
Considerable amount of quality seeds were produced through informal seed system (establishing Village Seed Hubs) of improved varieties and were distributed directly to farmers to accelerate Seed Replacement Rate (SSR). Recently, a DNA-based adoption and impact study was undertaken jointly by the CGIAR Independent Science and Partnership Council's Standing Panel on Impact Assessment (SPIA) and ICARDA. It showed that >90 per cent lentil areas have been covered by improved varieties in Bangladesh, producing an extra-production worth of USD 21 million annually, with more than 1 million small and marginal farmers are benefitting. Likewise, 58 per cent of the farmers adopted new varieties and improved production technologies in Nepal, producing an extra production of 36,128 tons, worth US\$ 29 m annually; with >843,000 farm families are directly benefitted. Lentil is being up-scaled in eight states in India.

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## International Centre for Integrated Mountain Development (ICIMOD)

### The Hindu Kush Himalaya Assessment: Mountains, Climate Change, Sustainability and People



ICIMOD's new publication (Source: ICIMOD)

Styled after the Intergovernmental Panel on Climate Change (IPCC) reports, the recently released Hindu Kush Himalaya Assessment: Mountains, Climate Change, Sustainability and People report is the first and most authoritative study of its kind to provide an assessment of one of the world's most significant, yet often overlooked, mountain regions. Developed over five years, it includes insight by more than 350 researchers and policy experts from 22 countries and 185 organizations. With 210 authors, 20 review editors and 125 external reviewers, it provides an unprecedented insight into the region's distinct environment, people and wildlife. The study was coordinated through the Hindu Kush Himalayan Monitoring and Assessment Programme (HIMAP) of the International Centre for Integrated Mountain Development (ICIMOD).

Divided into sixteen chapters, the report also calls for greater recognition of mountain areas and the HKH region in global climate efforts. The report can be downloaded from: <http://www.icimod.org/?q=33860>

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## International Crops Research Institute for Semi-Arid Crops (ICRISAT)

### Africa and Asia come together to lead a global initiative to diversify staples

Leading agriculture organizations from Africa and Asia have joined hands to take on a bold initiative to create a big new industry, with the intent of bringing some Smart Foods back on the plate as major staples. Targeting staples lays the foundation to generate major impacts on health and the agri-food system. The inaugural meeting and signing of agreements by the largest agriculture associations in Africa and Asia took place on 13 January 2019.

*"This new partnership strengthens collaborations between Asia and Africa and can open up opportunities to join forces at any point along the value chain, from consumers through to processors, chefs through to farmers, researchers and others," Dr Peter Carberry, Director General, ICRISAT.*

"Smart Food is a noble and novel idea and well thought through. The major staples did not get to where they are by accident. There are benefits and financial viability, but this viability varied for different value chain players. We need to learn from these successes and ensure financial sustainability. Engaging with large players is a part of making this come to reality to ensure benefits to smallholder farmers and the environment," highlighted Mr. William Asiko, Board member, FANRPAN.

“I see how we can make Smart Food a household name. We need to link and synergize other existing programmes along the whole value chain. Capacity building will be one opportunity especially in taking a holistic Smart Food approach where issues around nutrition/health, environment and farmer welfare can be tackled,” said Dr. Ravi Khetarpal, Executive Secretary, APAARI.

This culminated in the formation of the Smart Food Executive Council led by – the Asia-Pacific Association of Agricultural Research Institutions (APAARI), Forum for Agricultural Research in Africa (FARA), West and Central African Council for Agricultural Research and Development (CORAF), Food Agriculture and Natural Resources Policy Analysis Network (FANRPAN), along with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) which set in motion the Smart Food initiative in 2013.



*The members of the Smart Food Executive Council  
(Source: ICRISAT)*

“We see history unfolding before us as this is how big things emerge. Smart Food resonates with the desire to see the power of science translate into reality. I am happy that Smart Food is now institutionalized. FARA is excited to cooperate in this partnership and hold this partnership responsible for the success,” shared Dr Yemi Akinbamijo, Executive Director, FARA.

This partnership is part of a new effort to make a major contribution to the Sustainable Development Goals (SDGs). The approach is to focus on diversifying staples. Given that staples may typically constitute 70% of a meal and are often eaten three times a day, diversifying them can have a pronounced impact on overcoming malnutrition and poverty and coping with climate change and environmental degradation.

“This approach is a fitting response to today’s major global issues. We want to add to the big crops; not displace them. Moving from the Big 3 staples (rice, wheat and maize) to having more, the Big 5 and later the Big 7, is an important aim. Now we have to go from a pitch to reality. Key to this are the nutrition and climate change adaptation needs and this is core to Smart Food. Smart Food crops have been neglected for reasons other than value as they are inherently nutritious and adaptable to diverse farming systems. We need to promote these inherent values,” pointed out Dr Abdulai Jalloh, Director of Research and Innovation, CORAF.

This will contribute to the SDGs for overcoming poverty and hunger (SDG 1 and 2), responsible consumption and production (SDG 12), along with adaptation to climate change (Goal 13). The approach taken will include gender equality (SDG 5) and action through partnerships (SDG 17).

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## FORTHCOMING EVENTS

- 4th International Agriculture Innovation Conference, Oulu, Finland, 8-9 August 2019, IAIC
- The Asian Agriculture Summit & Exhibition 2019, Kathmandu, Nepal, 11-13 August 2019, 4-H Nepal
- 15th Agriculture & Fisheries Technology Forum & Product Exhibition, Manila, Philippines, 15-18 August 2019, BAR
- Training of Trainers Workshop on Synthetic Aperture Radar and Google Earth Engine, Pokhara, Nepal, 15-19 July 2019, ICIMOD
- 58th All India Wheat and Barley Meeting, India, 24 August 2019, ICARDA, CIMMYT
- International Forum on the Cryosphere and Society, Kathmandu, Nepal, 28-30 August 2019, ICIMOD
- Global Science Conference on Climate-Smart Agriculture, Bali, Indonesia, 8-10 October 2019, ACIAR, CCAFS, Indonesia's Ministry of Agriculture, Ministry of Agriculture and Food Quality of the Netherlands
- 46th Session of the Committee on World Food Security (CFS), Rome, Italy, 14-18 October 2019, FAO, IFAD, World Food Programme
- 13th International Food Data Conference (IFDC), Lisbon, Portugal, 15-18 October 2019, ICRISAT
- Regional Workshop on Youth as Torch Bearers of Business Oriented Agriculture in South India, Hyderabad, Telangana, India, 21-22 October 2019, TAAS, APAARI, YPARD, PJTSAU
- Wheat Diversity & Human health, Istanbul, Turkey, 22-24 October 2019, CIMMYT
- Asian Solanaceous Round Table III, Bengaluru, India, 22-25 October 2019, APSA. ICAR, IIHR, Society for Promotion of Horticulture

- 7th International Cereal Nematodes Symposium, New Delhi, India, 3-6 November 2019, CIMMYT, ICAR
- International Training Course on 'In Vitro and Cryopreservation Approaches for Conservation of Plant Genetic Resources, New Delhi, India, 5-19 November 2019, ICAR, APAARI, APCoAB, Bioversity International
- The 3rd International Conference on Food, Nutrition, Health and Lifestyle 2019, Bangkok, Thailand, 7-8 November 2019, TIIKM
- The 26th Asian Seed Congress (ASC2019), Kuala Lumpur, Malaysia, 25-30 November 2019, APSA
- Ninth International Conference on Fermented Foods, Health Status and Social Well-Being, Anand Gujarat, India, 13-14 December 2019, Anand Agricultural University



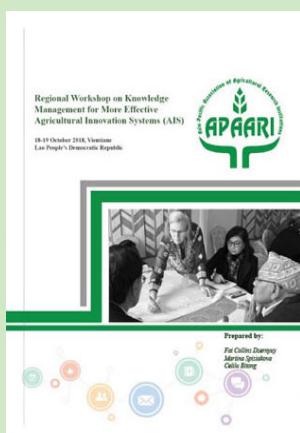
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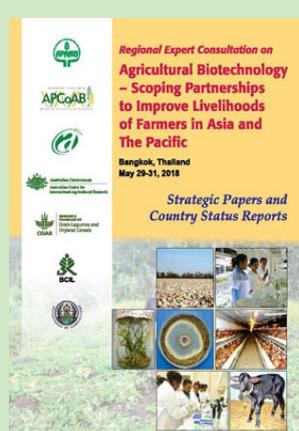
- Agricultural Biotechnology Research Center, Academia Sinica, Taiwan



## LATEST PUBLICATIONS



*Proceedings of the Training on Transformation of Agricultural Education through Knowledge Management and Capacity Development for More Effective Agricultural Innovation System (AIS)*



*Agricultural Biotechnology – Scoping Partnerships to Improve Livelihoods of Farmers in Asia and the Pacific: Strategic Papers and Country Status Reports*

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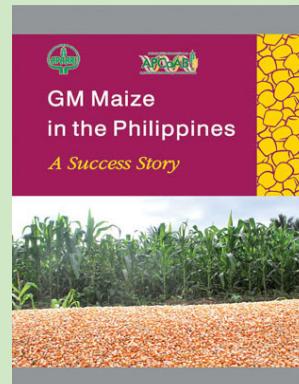
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### ASTI Flyer



*APAARI acknowledges the partnership and support of all the members and stakeholders*

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